Space Weather Technical Forecast

Issued on Sunday, 29 May 2022 at 01:23 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: Slight chance of and isolated M-class flare. Slight chance of G1/Minor Storm interval.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Low over the past 24 hours, with GOES16 recording occasional low-level C-class X-ray flares, with the background flux at B-class. There are currently five visible sunspot regions on the Earth-facing side, all of which are small and simple. AR3017 is no longer visible on the western limb, but it is still possible to see flares from this region. No Earth directed CMEs have been observed in coronagraph imagery in the last 24 hours, although there is a south directed CME that left the Sun on 28th May, this is expected to miss, but there is a slight chance of a glancing blow on 1st June.

Solar Wind / Geomagnetic Activity: The solar wind, as observed by DSCOVR at L1, indicated the presence of the HSS of CH84 or CH85. Wind speeds were slightly elevated or elevated throughout, varying between 450-570 km/s. Density was largely average. The IMF, Bt, started moderate with a peak of 10nT before becoming largely weak after 28/0520 UTC. The north-south component, Bz, ranged between +7/-9nT, gradually becoming weakly northward directed through the second half of the day. The phi angle was mainly negative (towards the Sun). Geomagnetic activity started with 3 G1/Minor Storm intervals before gradually easing back to Quiet.

Energetic Particles / Solar Radiation: The high energy proton flux (10 MeV) has been at Background levels through the last 24 hours. The high energy electron flux (greater than 2 MeV) was at background levels. Corresponding electron fluence has remained well below the Active threshold (1e8 integrated pfu), with an earlier sharp decline, and 1.88e6 integrated pfu observed at 29/0000UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is now expected to be mainly Low, with AR3017 rotating off the western limb. There is a very slight chance of M-class flares through this period. There is one bright flux region appearing on STEREO EUV imagery over the eastern limb, but this will take several days to appear on the visible disk.

Solar Wind / Geomagnetic Activity: No Earth directed CME's feature in the forecast, though there is a south directed CME that left the Sun on 28th May, this is expected to miss, but there is a slight chance of a glancing blow on 1st June. The Earth is currently experiencing the fast wind from one or both CH84/- or CH85/-. Elevated winds speeds on day 1 (29th) will likely ease to slightly elevated by day 2 (30th), probably becoming slow ambient by day 3 (31st).

Geomagnetic activity is expected to be Quiet to Active with a slight chance of G1/Minor Storm intervals on day 1 (29th). Geomagnetic activity should become mostly Quiet by day 2 (30th), with a marginal chance of increased activity on day 4 (01 June).

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV) is expected to be at Background levels during this period.

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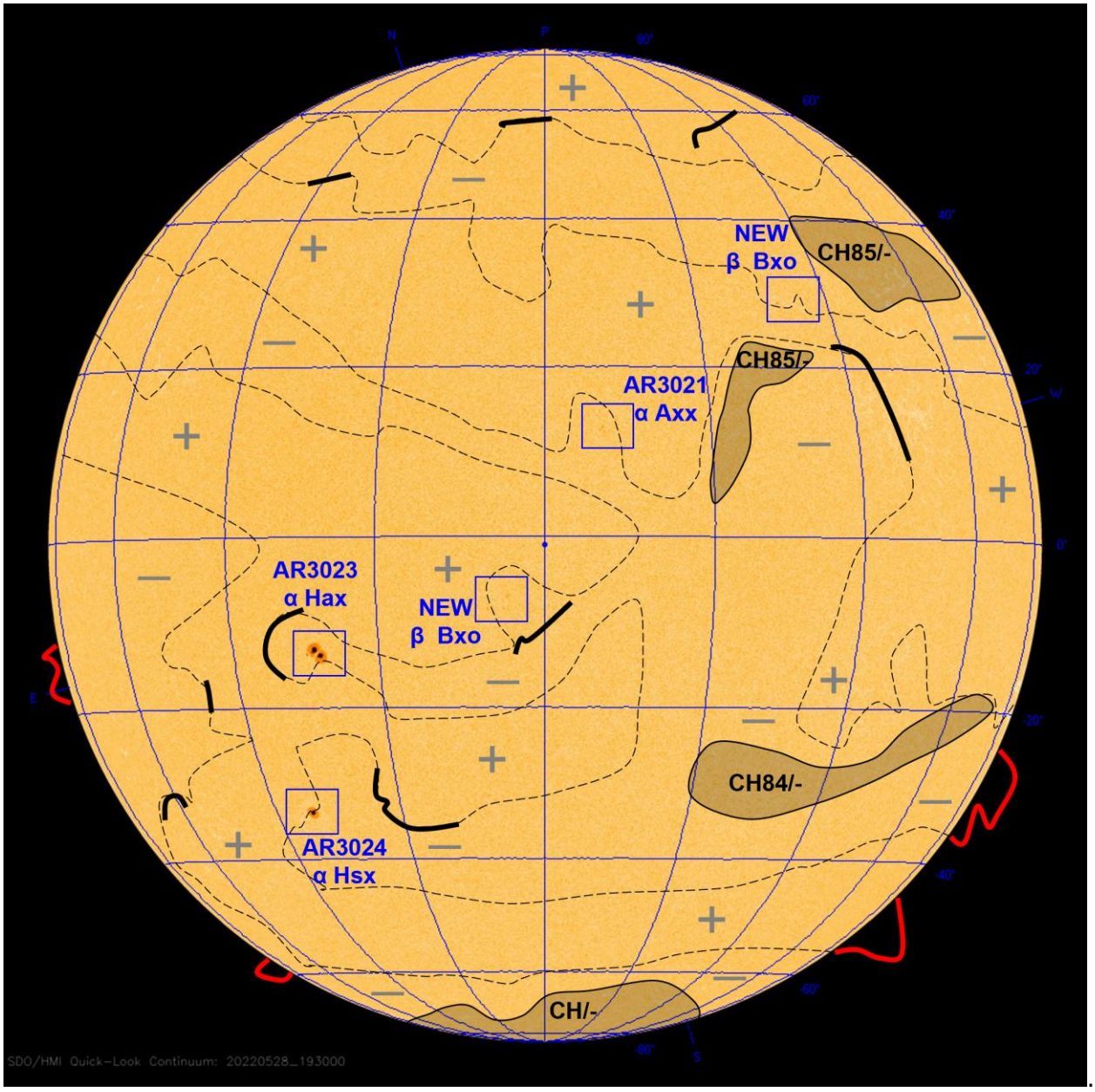
High energy electron flux (greater than 2MeV) is expected to remain at background levels initially, with a probable rise in response to the high speed stream(s) of CH84/- and/or CH85/-. The risk of reaching Active (1e8 integrated pfu) levels will rise into the new working week as the HSS and possibly CME effects wane.

Figure 1. Solar Analysis Valid 28/2000 UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

No Earth directed CME's are expected, though the CME from the 28th is expected to pass below Earth, with a slight chance this may give a glancing blow on 1st June.

Earth is currently experiencing the fast wind from one or both of coronal hole(s) CH84/- or CH85/-. These coronal holes are rather complex in nature, extending a fair latitudinal distance across the western disc and as such elevated or slightly elevated wind speeds may last into day 2 (30 May), probably easing back to background by day 3(31 May).

Geomagnetic activity is expected to be Quiet to Active with a slight chance of G1/Minor Storm intervals on day 1 (29th). Geomagnetic activity should become mostly Quiet by day 2 (30th), with a marginal chance of increased activity on day 4 (01 June).

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	15	5	1	5
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X-Ray Flares:

The visible regions on the disc are currently all small and simple with a low flare risk. AR3017 is no longer visible on the west limb, but will contribute a small amount to the flare risk until clear of the limb. As such, there is a very slight chance of M-class flares.

There is one bright flux region appearing on STEREO EUV imagery over the eastern limb, but this will take several days to appear on the visible disk, therefore in the short-term, any rise in flare risk would need to be home-grown on the Earth-facing side.

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	5	3	3	3
Very Active	R3 to R5 X Class	No	1	1	1	1

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Solar Radiation Storms - (High Energy Protons):

The high energy proton flux (greater than 10 MeV) is at Background levels and is most likely to remain so through the period.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	2	1	1	1
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

High Energy Electrons Event (≥ 2MeV):

The High energy electron flux (as measured by GOES-16) is currently at normal background levels. In the immediate term, flux levels are likely to be attenuated by geomagnetic activity from the fast wind(s), with wind speeds probably sufficient to compress the radiation belts and suppress electron counts at GEO through 29th May. A gradual decompression of the radiation belts is likely through this period, with an increase in flux probable, assuming charging has occurred with the faster winds.

The chances of Active electron fluence should then increase into the new working week, with the magnitude of any response low confidence, but perhaps becoming likely to pass Active by day 3 (31st).

MOSWOC REFM's forecast is currently running counter to the expected evolution, likely because the recent rise in wind speeds has not yet fully been ingested into the model. Persistence is offering a better guide in this respect, although the fact that the coronal holes differ between rotations should mean that details differ. Persistence is likely indicating the upward trend too soon.

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	10	40	60	60
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

Figure 2: REFM, Observed, Forecast and Recurrence fluence/integrated 24 hour flux.

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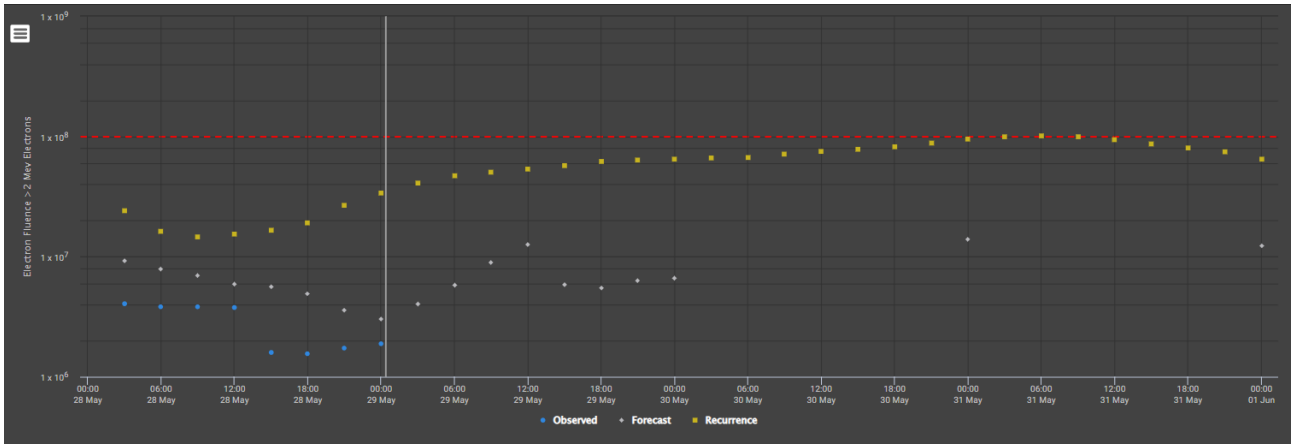

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